SECTION I

CHRONOLOGY

12 JUL 1956 ... Detachment "C" activated

12 JUL 1956 ... First group Det "C" personnel arrive [redacted] 25X1

8 AUG 1956 ... [redacted] assumed command 25X1

10 AUG 1956 ... First U-2 assigned to Detachment "C"

14 AUG 1956 ... First hour flown in U-2 by Detachment "C" personnel

24 OCT 1956 ... Completion of required flying training by contract pilots

26 OCT 1956 ... Completion of Unit Simulated Combat Mission *

19 FEB 1957 ... Advance party departed for overseas station (Atsugi Naval Air Station, Japan)

21 FEB 1957 ... 1,000th hour flown by Detachment "C" personnel

8 MAR 1957 ... Flying activity ceased at [redacted] Unit prepared for deployment to "Far East" station. Departure scheduled for period 15-19 March 1957. 25X1

* Final report combat readiness of Detachment "C" Project "Aquatone", 29 October 1956 (Top Secret). Two copies furnished Project Headquarters.

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FOREWARD

1. This summary covers the operational activity of Detachment "C" during the period 14 August 1956 to 8 March 1957.

2. During this period Detachment "C" personnel completed the established training program leading to Unit Readiness under the supervision of the 4070th Support Wing (SAC); sucessfully completed a Headquarters directed Unit Simulated Combat mission and advanced into the field of operational training and testing while awaiting overseas deployment.

3. Operational training was divided into four categories:

   a. Detachment directed missions

   b. Project Headquarters directed missions

   c. Test projects in support of contractor furnished equipment

   d. Normal Maintenance test flights

4. The information presented herein is furnished for Project Headquarters information and possible future utilization by interested U.S. Government agency historians.

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T/S DET "C" # [redacted]
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TOP SECRET

OPERATIONAL SUMMARY

OPERATIONS DIRECTORATE

AIR WEATHER RECONNAISSANCE SQUADRON PROVISIONAL (III)

PERIOD

14 AUGUST 1956 TO 8 MARCH 1957

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TOP SECRET

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C-O-N-T-E-N-T-S

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SECTION III

FLYING EFFECTIVENESS

1. In October 1956 Detachment "C", having completed all required training, began scheduling all unit missions. This function had been performed by the 4070th Support Wing (SAC) while Detachment "C" was in its training phase.

2. The attached graphs portray the effectiveness of the Detachment during the period October 1956 to March 1957. (Appendix C)

3. The daily average aircraft possessed during this period was 3.2 aircraft which represented 64% of authorized aircraft.

4. A recapitulation of the monthly activity graphs indicates:

   a. 970:40 hours scheduled

   b. 844:55 hours flown

   c. 87% effectiveness of hours flown as to hours scheduled

   d. 207 sorties scheduled

   e. 175 sorties flown

   f. 84.5% effective sorties scheduled vs flown

5. Prior to the Detachment's establishment of monthly flying time utilization records and statistics the Detachment flew a total of 101:20 hours.

6. The total flying time of this Detachment at present is 1,072 hours.

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SECTION IV

TOTAL U-2 FLYING EXPERIENCE OF ASSIGNED PERSONNEL

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CONTRACT PILOTS	TOTAL	DAY	NIGHT	HOOD	LNDGS'	GCA'S
[redacted]	135:40	51:25	16:10	68:05	65	19
	122:35	25:45	10:50	86:00	54	24
	130:40	53:15	16:05	61:20	79	30
	105:05	84:50	11:20	8:55	53	17
	143:45	117:35	18:10	8:00	84	17
	132:05	112:05	14:25	5:35	54	21
	126:25	99:25	14:00	13:00	58	12
	148:20	95:35	23:15	29:30	75	17
	1,044:35	639:55	124:15	280:25	522	157
25X1						
STAFF PERSONNEL						
[redacted]	19:35	17:30	1:00	1:05	22	10
	6:25	5:55	0:00	0:30	12	2
	1:25	1:25	0:00	0:00	6	0
	27:25	24:50	1:00	1:35	40	12
TOTALS						
PILOTS	1044:35	639:55	124:15	280:25	522	157
STAFF	27:25	24:50	1:00	1:35	40	12
	1072:00	664:55	125:15	282:00	562	169

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SECTION V

RESUME OF UNIT PROFICIENCY

1. Average experience of contract pilots:

   a. 130:54 total flying hours (U-2)

   b. 79:55 hours "Day"

   c. 15:30 hours "Night"

   d. 35:01 hours "Hood"

   e. 65.2 landings

   f. 19.4 GCA's

2. Unit navigation and photo performance:

   a. Day celestial observations - 359

   b. Night celestial observations - 59

   c. Circular error average (day) - 11.3 nautical miles

   d. Circular error average (night) - 7.8 nautical miles

   e. Number of film scored target runs - 243

   f. Average flight line deviation over target - 1.24 nautical miles

3. Quality of tracker film examined for scoring:

   a. Good - 49

   b. Fair - 5

   c. Poor - 8

   d. Malfunction - 17

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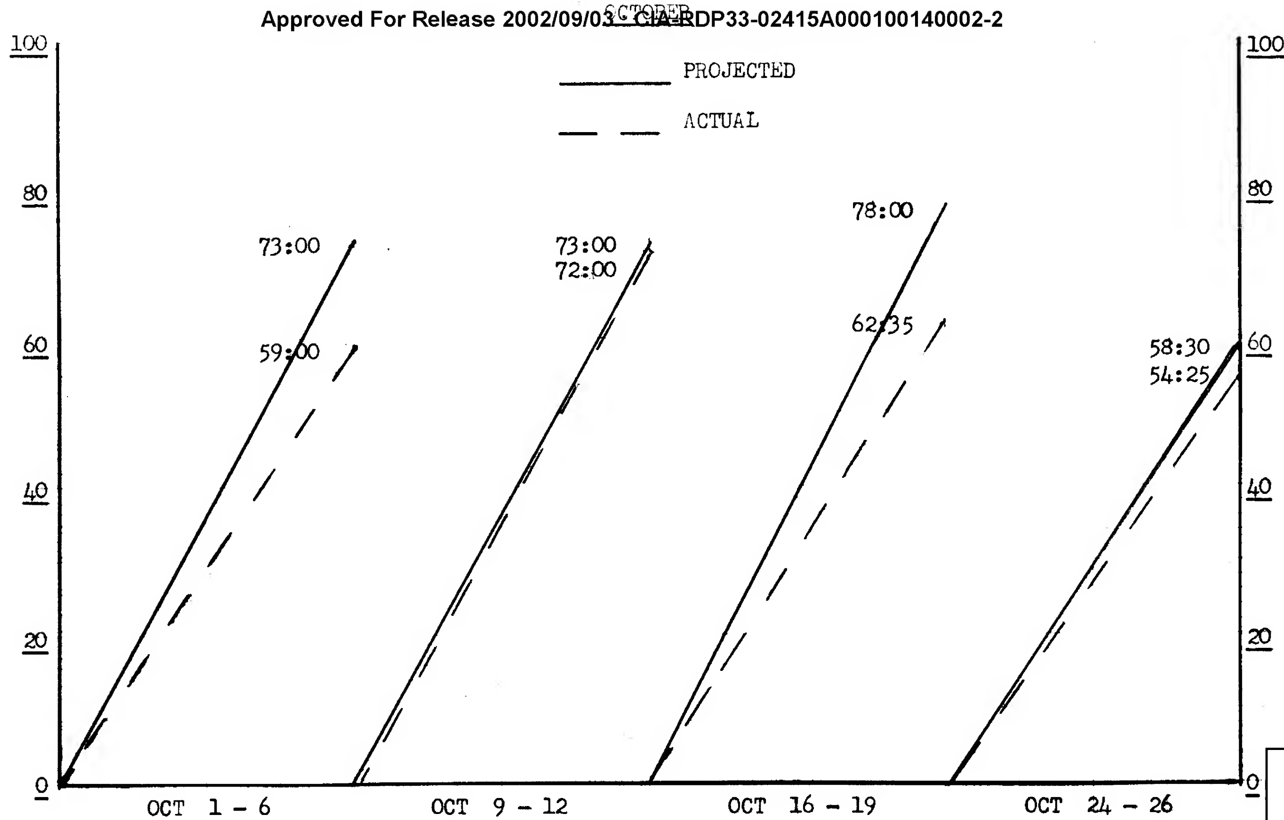
OCTOBER



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HOURS SCHEDULED	- 281:30		SORTIES SCHEDULED	- 57
HOURS FLOWN	- 249:00		SORTIES FLOWN	- 48
PERCENTAGE	- 88.6%		PERCENTAGE	- 84.2%

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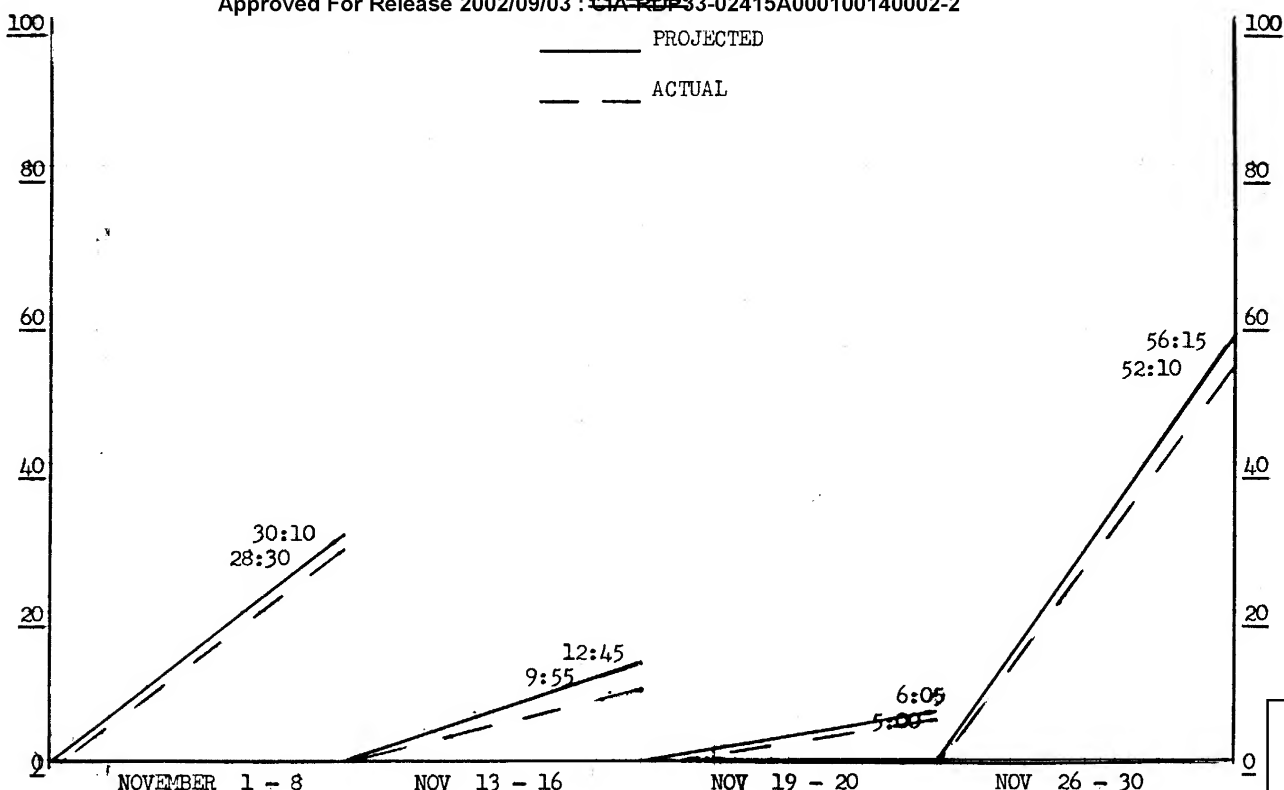
APPENDIX "B"

NOVEMBER



HOURS SCHEDULED - 102:15
HOURS FLOWN - 97:50

PERCENTAGE - 95.~~1~~%

SORTIES SCHEDULED - 29
SORTIES FLOWN - 22

PERCENTAGE - 75.8%

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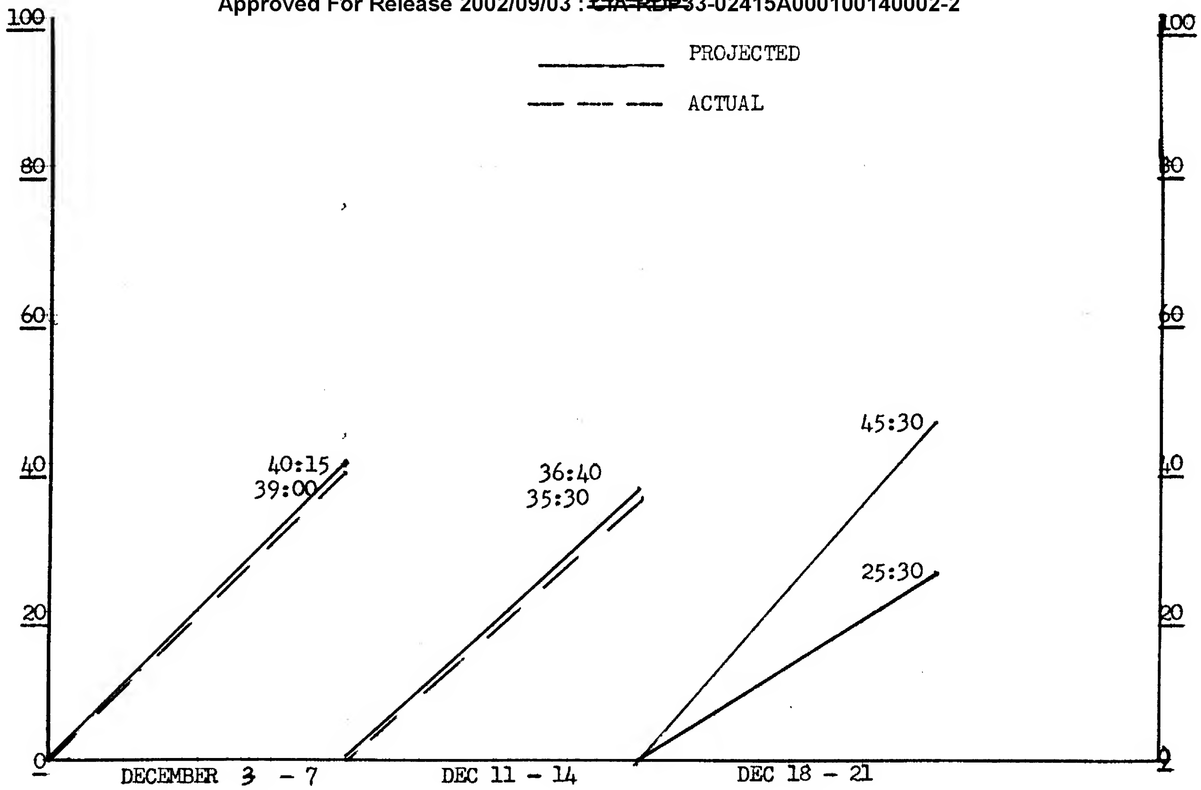
APPENDIX "B"

DECEMBER



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HOURS SCHEDULED - 121:15
HOURS FLOWN - 101:10

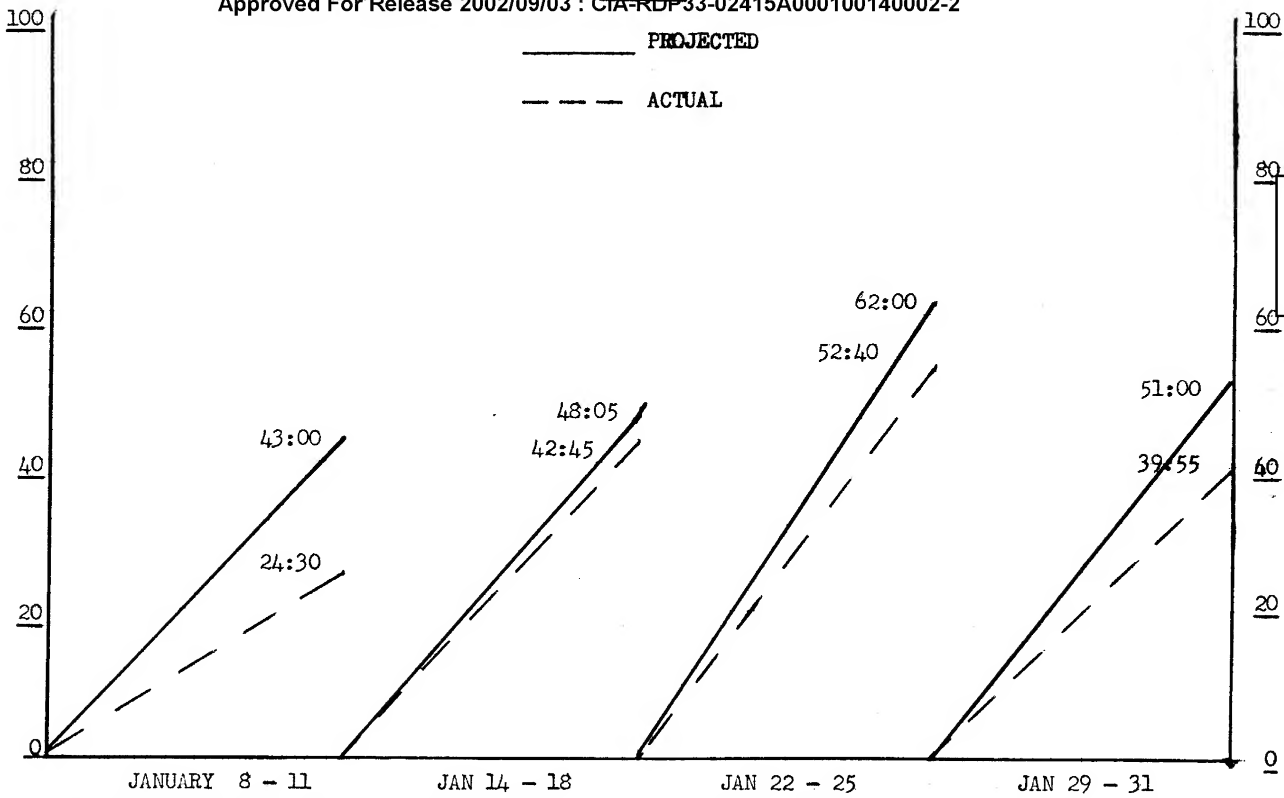
PERCENTAGE - 83.4%

SORTIES SCHEDULED - 28
SORTIES FLOWN - 24

PERCENTAGE - 85.7%

APPENDIX "B"

JANUARY



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<u>Aircraft 351*, 358, 360</u>

HOURS SCHEDULED	– 205:50
HOURS FLOWN	– 159:50
PERCENTAGE	– 77.5%
SORTIES SCHEDULED	– 42
SORTIES FLOWN	– 35
PERCENTAGE	– 83.3%

<u>Aircraft 358 and 360</u>

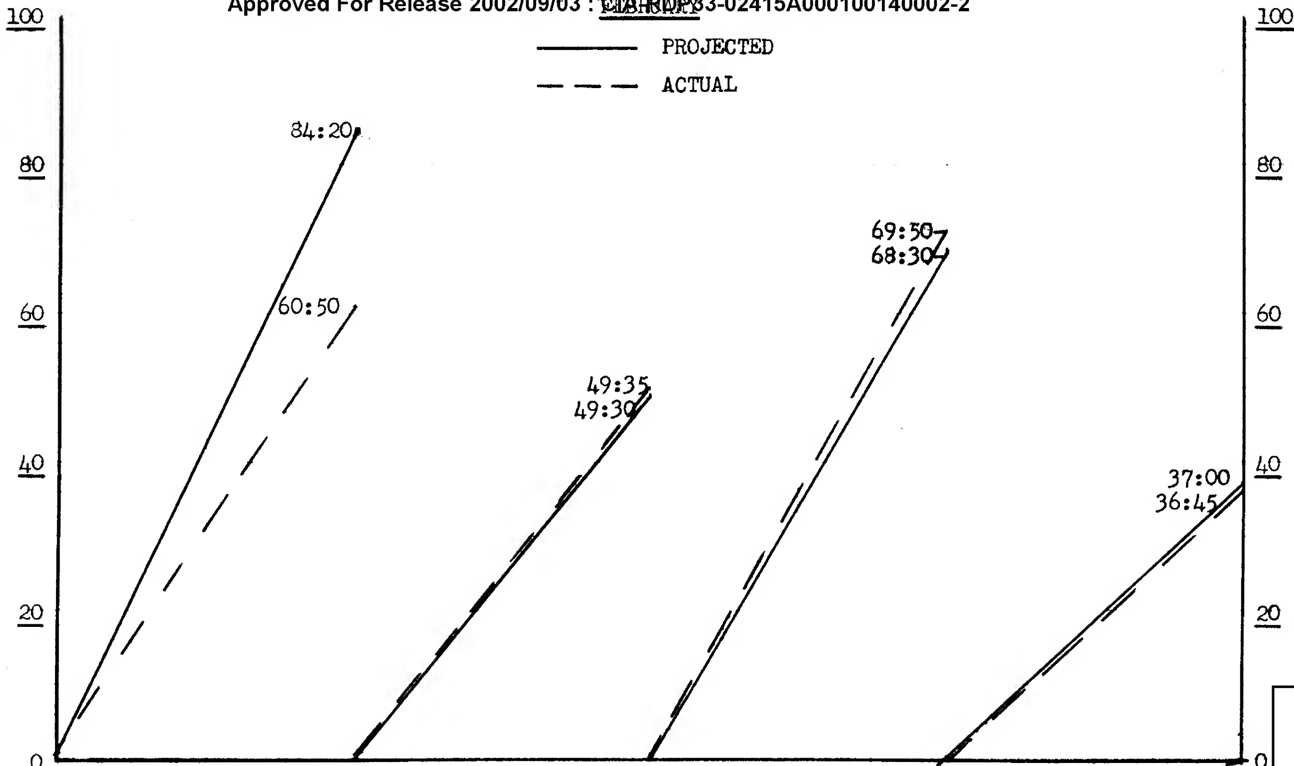
HOURS SCHEDULED	– 156:20
HOURS FLOWN	– 129:10
PERCENTAGE	– 82.6%
SORTIES SCHEDULED	– 32
SORTIES FLOWN	– 27
PERCENTAGE	– 84.3%

* Flight test aircraft, manned by flight test crew.

Headquarters scheduled and cancelled three (3) missions totaling 21 hours. Eliminating acft. 358 and the missions cancelled by headquarters reflects the efficiency of Det "C" as follows:

HOURS SCHEDULED	– 135:20	SORTIES SCHEDULED	– 29
HOURS FLOWN	– 129:10	SORTIES FLOWN	– 27
PERCENTAGE	– <u>95.5%</u>	PERCENTAGE	– <u>93.1%</u>

APPENDIX "B"



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Aircraft 343, 351*, 358, 360

HOURS SCHEDULED - 239:20
HOURS FLOWN - 217:00

PERCENTAGE - 90.8%

SORTIES SCHEDULED- 44
SORTIES FLOWN - 39

PERCENTAGE - 88.6%

Aircraft 343, 358, 360 (Det "C" aircraft)

HOURS SCHEDULED - 197:20
HOURS FLOWN - 196:00

PERCENTAGE - 99.4%

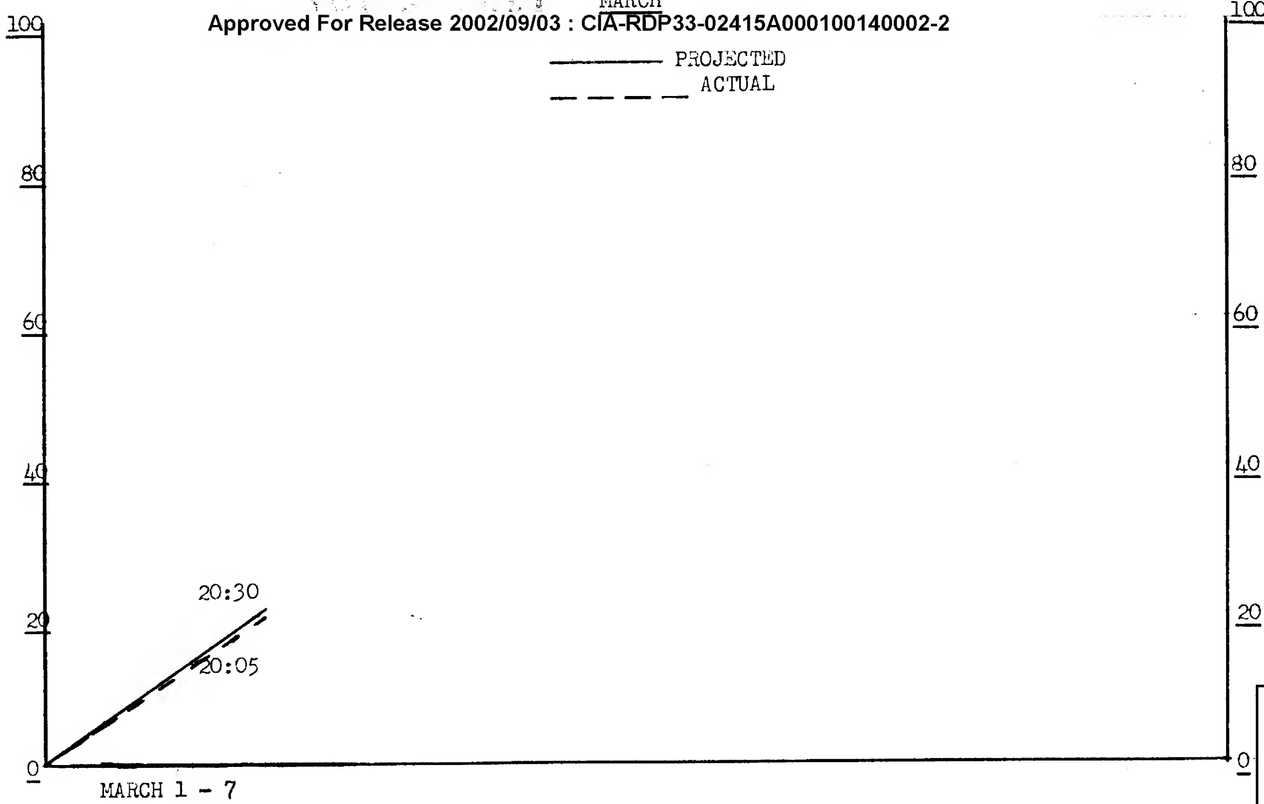
SORTIES SCHEDULED- 33
SORTIES FLOWN - 32

PERCENTAGE - 97.2%

* Flight Test Aircraft, manned by flight test crew.

 APPENDIX "B"

MARCH



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On March 7th, flying activities were ceased [redacted] in order that Detachment "C" could prepare for deployment overseas. Detachment "C" accomplished the following in five days of flying during the month of March while located [redacted]

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HOURS SCHEDULED	-	20:30	SORTIES SCHEDULED	-	7
HOURS FLOWN	-	20:05	SORTIES FLOWN	-	7
Percentage	-	98.7%	Percentage	-	100%

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APPENDIX "B"

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SECTION VI

DETACHMENT "C" CELESTIAL NAVIGATIONAL SUMMARY

Since the first of the year, navigation by celestial means has received increased emphasis and study. New celestial navigation techniques and procedures have been developed and tested. Individual and unit celestial navigation reliabilities have been closely monitored and evaluated. The results and conclusions formed from these programs confirm that celestial navigation accomplished from the U-2 aircraft is an acceptably accurate and useful corallary to other available means of air navigation.

The objectives of the aforementioned program were threefold:

1. To definitely establish the reliability and average error of celestial observations taken from the U-2 aircraft by unit drivers.

2. To devise new techniques whereby these celestial observations could be placed to practical usage in navigating the U-2 aircraft.

3. To develop and maintain the confidence of unit drivers in celestial navigation as a reliable and proven navigational technique.

The third objective, that of building the driver's confidence in celestial navigation, was attacked first. It is noteworthy to point out that previous to their present assignment, less than one half of the drivers had had any previous celestial navigation experience. Those with previous experience were limited to a basic background of celestial theory and some airborne observation using a hand-held sextant. Their celestial
25X1 training phase [redacted] was limited to a refresher course on basic theory, the mechanics of the U-2 sextant configuration, and to scheduled airborne observations, normally accomplished at 15-20 minute intervals. These observations served the purpose of training the driver in sextant technique, but were not directly and specifically applied to the navigation problem. The tendency among the drivers was to look upon these observations as something to be accomplished but of little practical value.

The driver's route charts had been annotated with precomputed information against which he would compare his observation to determine observation error, rather than navigation error. The presupposed, natural tendency was to consciously or unconsciously favor the precomputed information when making a celestial observation. As a result, the drivers reached a state of mind whereby they questioned the reliability of their own observations.

[redacted] 25X1

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To overcome this first mental obstacle, each unit driver was scheduled to accomplish celestial observations without the benefit of pre-computed information on their charts. A rough approximation of the celestial body's altitude and azimuth were briefed whereby the body could be located within the field of sextant view. The drivers were instructed to make celestial sightings at predetermined times and to record their observation readings. For each sighting, a computed altitude was determined by reconstructing the flown route from film plot. A comparison of the computed altitude and the observed altitude revealed the observation error. At the conclusion of these tests, the average error in day celestial observations for the Detachment was almost identical to the previous average error. These results refounded the driver's confidence in himself to make acceptably accurate observations.

To place these observations to a practical navigation application was the follow-up celestial program. This was a requirement for the staff as well as for the drivers to realize. To a greater degree than with Detachment "A" and "B", this Detachment will be operating in an area which compounds the navigation problem. Aeronautical charts are often inaccurate and incomplete. Physical and man-made features are often less prominent and unidentifiable. Weather and wind forecasts are less accurate and sometimes grossly in error. The problem posed by these inadequacies is not one of the driver becoming lost, but rather one of not finding the briefed target. The need for any navigational aid to supplement basic dead-reckoning and pilotage map reading is apparent.

Inasmuch as the unit mission is dependent at this time on sunlight, only the application of day celestial lines of position was investigated. This restricted the celestial application to single lines of position or most probable positions. Only speed lines or course lines of position were considered useful, and then only if they were within a ten (10) degree spread either side of abeam or fore and aft of the aircraft heading.

Eight sorties were planned for the specific purpose of gathering data on the reliability of flying extended distances using celestial observation for navigating the U-2 aircraft. Each sortie had a planned celestial course line leg and a celestial speed line leg to accomplish. The average length of these legs was 832 nautical miles. These missions were planned over generally poor weather areas with the purpose in mind of further re-assurance to the driver that if need be extended navigation is possible through celestial means. Where possible, destinations were selected on the fringe of a clear weather area to permit film plotting of the aircraft position. Where clear weather did not exist at destinations, a radio fix was accomplished to determine error in the aircraft position.

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The drivers were briefed to depart from a pre-determined position and to maintain flight plan headings and indicated air speeds until reaching the precomputed position to begin their celestial observations. A series of five (5) sun shots were precomputed for each leg. The first and second shots were taken at a point approximately one hour's distance prior to destination. These first two shots were intended primarily to afford the driver the opportunity to smooth out his sextant technique and secondly to get an initial approximation of aircraft position.

The final three (3) sun shots were precomputed at five (5) minute intervals beginning at a flight plan position approximately one half hour from destination. Each of the three observed altitudes was compared individually to the computed altitude for the same time and the difference or intercept distance determined. The three intercept distances were then added algebraically and divided by three to compute the average intercept distance for the mid time observation. A course or ETA correction, dependent upon whether a course or speed line leg was being flown, was then computed and applied. The results of these eight sorties are reflected in Appendix "A" (Celestial Navigation Proficiency, Course and speed line legs).

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CELESTIAL NAVIGATION PROFICIENCY (COURSE AND SPEED LINE LEGS)

	DRIVER	DATE FLOWN (1957)	AIRCRAFT NUMBER	SORTIE NUMBER	COURSE LINE LEG		SPEED LINE LEG		CELESTIAL OBSERVATIONS		
					LENGTH (NM)	AZIMUTH ERROR (NM)	LENGTH (NM)	RANGE ERROR (MINS)	NUMBER SHOTS	CEA (NM)	CEP (NM)
1		7 FEB	360	C-53	1120	00	825	½ Early	9	8.4	6.0
2		19FEB	343	C-71	1275	03L	1000	0	10	7.2	4.5
3		21FEB	360	C-76	1015	10½R	725	0	10	13.3	10.0
4		21FEB	343	C-77	1015	15R	725	½ Early	10	7.2	6.0
5		22FEB	343	C-79	835	01½L	485	1 Late	9	7.5	6.5
6		22FEB	358	C-80	835	13L	485	1 Late	10	12.5	11.5
7		27FEB	360	C-82	1015 445	05½R 03½L	725	½ Early	12	6.0	5.5
8		27FEB	343	C-83	1015	6L	725	2 Late	9	7.0	4.0
				AVERAGES	952	6.4 (NM)	712	3/4Min (MIN)	79 SHOTS	8.6	6.7 (NM)

APPENDIX A

APPENDIX A

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[redacted]

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SECTION VII

HIGH ALTITUDE WINDS

This is a study of winds encountered at altitudes between 65,000 and 70,000 feet. These missions represent the first organized attempt to fly the winds as forecast, to actually check the accuracy of the forecast, and to establish criteria for an acceptable forecast. This analysis is one of the wind forecast capability and the wind observation capability of the pilots and aircraft. The wind field as shown by the rawinsonde observations for the applicable time is used as the standard to judge both the aircraft observed wind and the forecast wind.

A general analysis of all flights made from 1 January 1957 through 28 February 1957, shows that the average flight time for 28 missions was six hours and 58 minutes with a 4.4 minute departure from flight planned elapsed time for the mission. These missions averaged 17 legs of about 175 miles each, and were flown at altitudes averaging 66,200 feet mean sea level. Since averages seldom show the picture for the individual flight leg a more detailed analysis of ten missions is made showing the comparison between forecast winds, aircraft observed winds and rawinsonde winds. Included in these ten missions are <u>only</u> the missions where adequate tracker film was available for evaluation of aircraft winds or where the mission was flown according to the flight planned heading and airspeed. This latter procedure was followed on all wind forecast checking missions. These ten missions tend to show more than a proportionate share of the cases where unforecast winds were encountered. In some cases these wind checking flights were flown over clouds for 800 to 1000 miles with a radio fix or actual tracker film at the beginning and end of the leg to allow accurate checking of the aircraft wind. The unknown quantities in this system are the aircraft instruments, compass and airspeed indicator, and any variations in these two instruments induced by the human error. In most cases the aircraft winds correspond very closely to the observed rawinsonde wind field and confidence in these aircraft winds is high. There are a few exceptions to this confidence and it is possible that other variables such as radio compass errors, strong temperature gradients, altitude variations of 5,000 feet or more during the mission, or the time change in the wind field, may account for the deviations.

In order to keep this analysis as objective as possible, the 70,000 foot winds were plotted on the 50 millibar chart for the synoptic times of 1500Z and 0300Z for each mission. These times were usually at the beginning and at the end of the flight.

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After the streamline pattern was drawn, the winds observed by the aircraft were plotted using broken shafts on the wind flags. The chart which showed the best fit between the aircraft winds and the rawin wind field was used. The forecast winds were then plotted on the charts in red. This biases the whole wind picture in favor of the aircraft winds, but it is felt that this is a reasonable procedure under the circumstances. Figures one through ten show how the forecast and aircraft observed winds agree with the actual rawin observed wind field. The chart used for these overlays is the U.S. WRC 4-4E.

A detailed analysis of each of the attached ten figures is necessary to evaluate the varying performances, both of aircraft observations and forecast winds.

Figure 1 shows that the forecast winds for this flight, with few exceptions, were in poor agreement with the aircraft observed winds. In some cases the forecast winds verified with a higher degree of accuracy than the aircraft observed winds. The aircraft observed wind from Great Falls to Larson of 105 knots from 350 degrees deviates greatly for the forecast wind and from the actual wind of near 50 knots from 320 degrees. This wind is also inconsistent with the aircraft wind for the leg from Butte to Great Falls. This inconsistency leads one to suspect the validity of the aircraft winds in this area. The wind from Portland to San Francisco is in excellent agreement with the rawin wind field and requires the acceptance of proper instrument operation on the aircraft.

In Figure 2 all of the winds agree well with the exception of the forecast wind speed for the leg from Spokane to Bismark. In this case the forecast wind of thirty knots less than that actually observed by the aircraft would cause a serious error in estimated time of arrival at a target. The aircraft winds for this figure were taken from two missions flown by aircraft less than 15 minutes apart, and agree with the rawin wind field.

The forecast wind for the leg from Blythe to Amarillo, shown in Figure 3, is 15 knots stronger than the aircraft wind, but the rawin observations show that the forecast wind is probably nearer the correct wind speed. It should be noted however, that the aircraft flew from a slower moving wind field to a higher speed wind field as the flight progressed along the leg.

Figure 4 shows the close correlation between the forecast and aircraft winds and the rawin wind field for the whole mission. The whole flight plan had a two minute departure from the planned elapsed time with not over one minute departures on any leg. A wide turn was 25X1

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made at Portland and considered in evaluation of the flight plan. On the leg from Portland to Aberdeen, flight planned headings and indicated airspeeds were flown and the aircraft was only 43 miles North of Aberdeen at ETA.

Another wind checking flight is shown in Figure 5. The leg from Battle Mountain to Akron, Colorado, was designed as a wind checking leg and was flown over clouds for the whole distance except for a short distance at the beginning of the leg. The forecast wind and the aircraft wind agree excellently with the rawin wind field resulting in only a 22 mile error on the flight line. The termination of the leg was determined by radio compass and it has been noted that this radio compass installation consistently gives station passage about one minute prior to actual station passage. This error might amount to around seven miles.

Figure 6 shows a most interesting mission in which the aircraft winds depart rather radically from both the forecast winds and the rawin wind field. On the leg from Stockton to Portland the aircraft wind direction agrees with the rawin but the wind speed seems to be at least 15 knots too high in speed. The aircraft observed wind from Bozeman to Billings does not agree in direction or speed with the wind field, but with the possible error of too high a speed, the confidence in this wind is high. Excellent heading notes were available for this section of the flight as well as good tracker film which allowed accurate recapping of the wind encountered on this leg. Extreme turbulence was encountered in the region near Billings which further supports this strong wind. The fact that another aircraft encountered winds estimated to be near this one in speed, and also encountered such extreme turbulence that it flamed out, further supports this aircraft wind. The forecast wind for this mission was poor but it is very possible that the strong wind between Bozeman and Billings is a result of a mountain wave effect which causes undulation of the jet stream to higher altitudes in a standing wave pattern, and will be an insoluble forecasting problem. This problem is of the same magnitude as that of surface wind forecasting downstream from a barrier under mountain wave conditions, with a great deal less data available upon which to base the forecast.

In Figure 7 the forecast winds agree well with the rawin wind field but the aircraft winds are in very poor agreement. The leg from Sacramento to Palmdale shows an average aircraft wind for the leg which is roughly 180 degrees off in direction and 20 to 25 knots off in speed from the general wind field. The leg from Albuquerque to Lawton shows the aircraft wind to be about 70 degrees off in direction and about 15 knots off in speed compared to the rawin wind field. Confidence in these aircraft winds is low. The effect of the generally low temperatures encountered this day is not known, but may have some bearing on the final aircraft wind.

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The forecast and aircraft winds for the mission shown in Figure 8 agree quite closely but do not agree with the rawin wind field with respect to speed. In general they vary about 15 knots. The flight was accomplished with acceptable flight deviations by using the forecast winds.

In Figure 9 the aircraft winds can be seen to agree well with the rawin wind field although the aircraft winds are again about 10 knots high in speed. The forecast winds did not produce a flight plan acceptable, due to variation in direction; however, the wind field was such that these rather samll deviations are quite understandable. The flow was nearly West to East with a number of very small troughs moving through the system. The time change forecast of the wind under these conditions is very difficult.

Figure 10 shows disagreement between the aircraft winds and the rawin wind field with the exception of the wind from Albuquerque to Amarillo. This wind even appears to be at least 15 knots too strong. The forecast winds agree much better with the wind field although there is general tendency for more Westerly winds to be forecast than were actually observed. The cyclonic indraft located just Southwest of Barksdale is an unusual feature of this chart when compared to the others in this series, and just serves to emphasize the problems of forecasting the wind at this altitude even when winds are light. This is not a typical wind field feature for the latitudes around 45 degrees North latitude in the wintertime.

There are several unexplained features about this flight which cast doubt on the validity of the aircraft winds. There was a leak in the Mach sensor section of the pitot static system which may have given erroneous airspeed readings. The pilot also did not use pitot heat until letdown even though there was a layer of clouds to penetrate climbing to mission altitude. Both these facts and the obvious disagreement between the aircraft winds and the wind field leads one to have very little confidence in the aircraft winds for this mission.

CONCLUSIONS:

1. In general the winds observed by aircraft agree well with the rawinsonde observed wind field.

2. There are instances where the wind field at 50 millibars and 70,000 feet looks much like the wind field at lower "jet stream" altitudes and constitutes a definite operational hazard, both from the flight planning aspect and from the aspect of severe turbulence. At any rate we are not operating in a wind field that is typically light and at altitudes above the turbulence level.

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3. Wind forecast errors are significant in some cases but may not be any greater in magnitude than instrumental errors.

4. The constantly changing altitude of the aircraft flight path may have some bearing on the accuracy with which winds can be forecast, since this is not a constantly increasing flight profile as idealized, but one where the aircraft ascends and descends without reference to a time schedule.

5. There is some indication that turbulence may influence the aircraft in such a way to give erroneous flight line results using the normal instrumentation.

6. There seems to be systematic speed deviation of aircraft winds of about plus 10 to 15 knots. This effect is the same order of magnitude as the change in true airspeed which will occur with a 10 degree temperature departure below any standard used.

7. Certain anomalies in this high level wind field have been discovered by the wind flight technique which indicate that new thinking is necessary if the unusual features of the field are to be forecast. These features may be of such short duration that they may not be reflected by the 12 hourly rawinsonde observations.

8. An error in wind forecast is allowable which would put the aircraft within 50 miles of destination after flight over clouds of one thousand miles using dead reckoning alone. This requires a changing judgement of the allowable error in direction and speed. The speed error might be summed up by considering a direct head or tail wind of 20 knots to be the limiting error. With wind speeds in the 50 knot range an error of more than 15 degrees direction will place the aircraft outside a circle of 50 mile radius around the destination. For the normal wintertime wind it appears that errors in the wind forecast of 20 knots in speed and 20 degrees in direction will be acceptable most of the time.

9. Confidence in all aircraft winds is not high enough to allow them to be used as the sole verification measure for forecast winds. It is necessary to consider all tangible factors, such as available rawinsonde winds, and as many intangible factors, such as instrumental errors, as possible in each judgement of the forecast.

10. From extensive debriefing it has been determined that pilots place top priority on an accurate turbulence forecast when extreme turbulence is to be encountered. This is understandable when aircraft limitations are considered.

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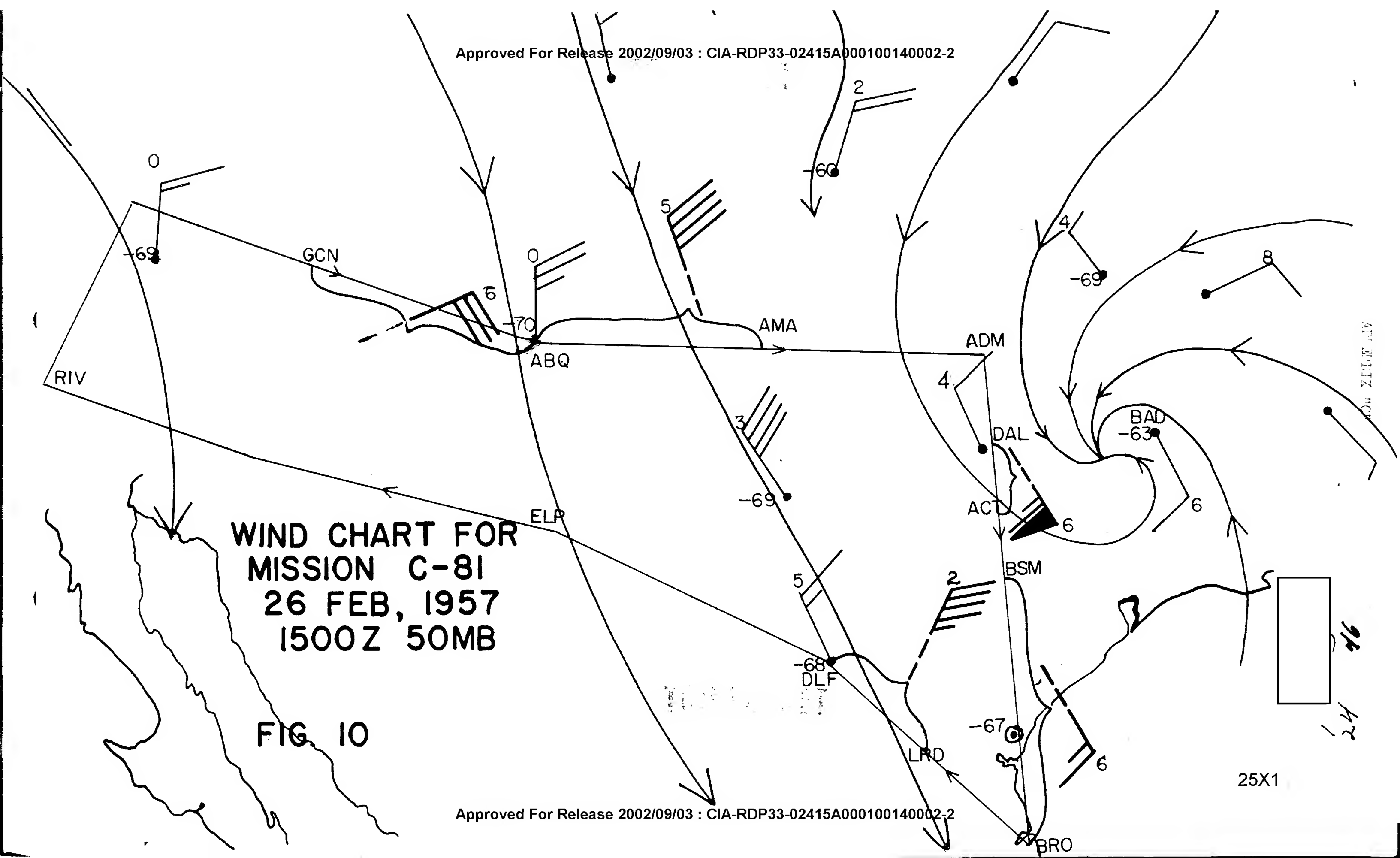
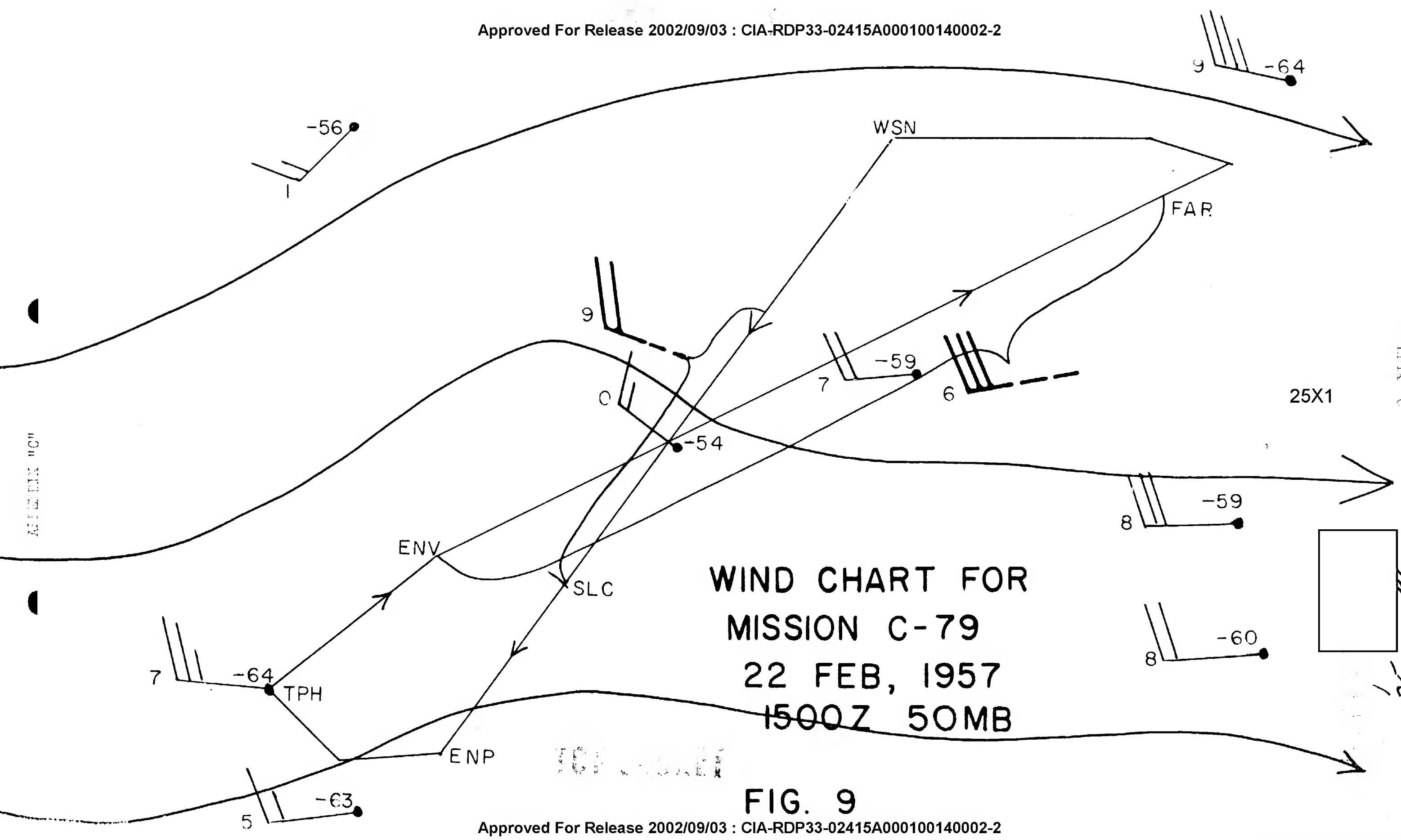


WIND CHART FOR
MISSION C-81
26 FEB, 1957
1500Z 50MB

FIG. 10



WIND CHART FOR
MISSION C-79
22 FEB, 1957
1500Z 50MB

FIG. 9

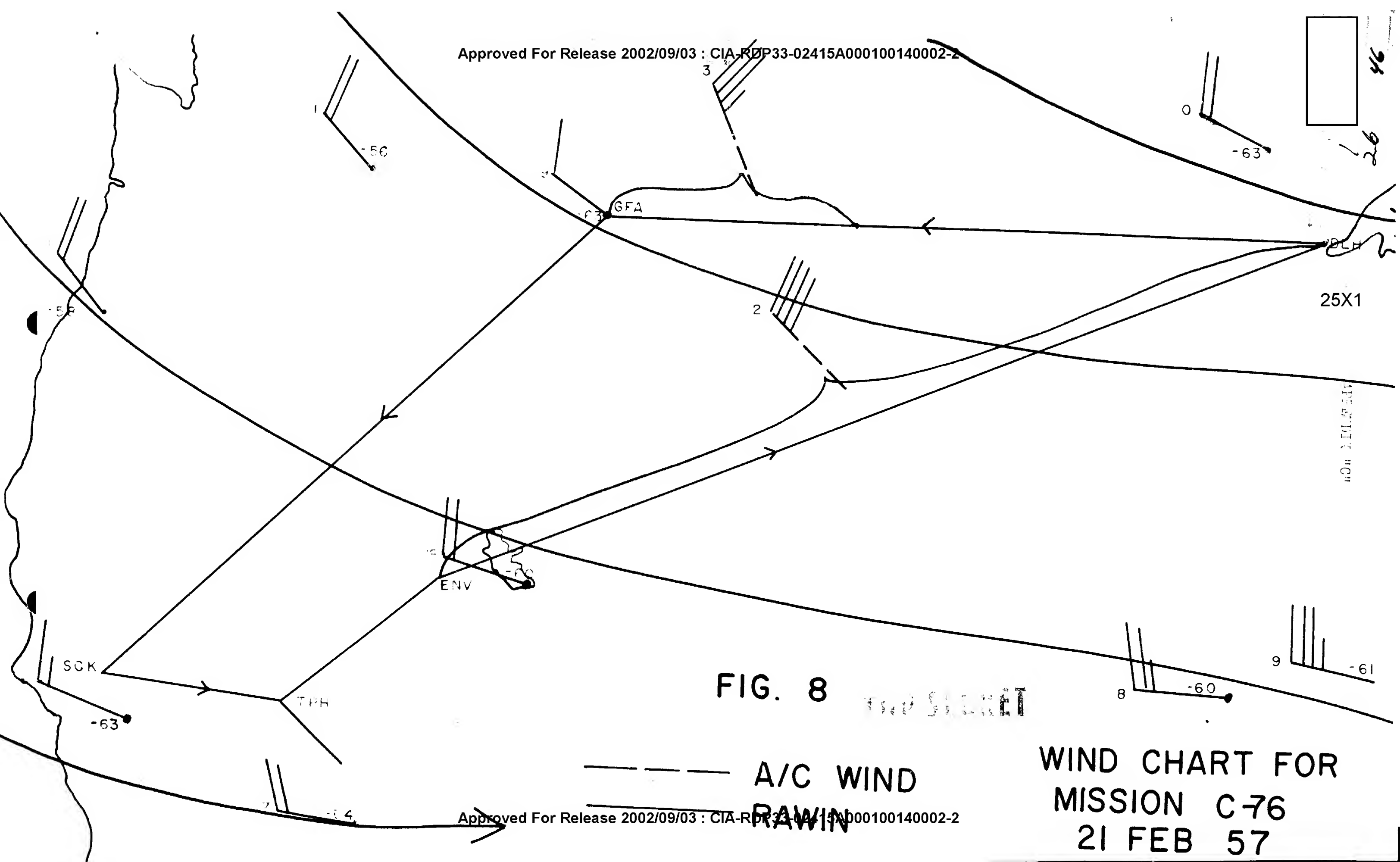


FIG. 8

TOP SECRET

WIND CHART FOR
MISSION C-76
21 FEB 57

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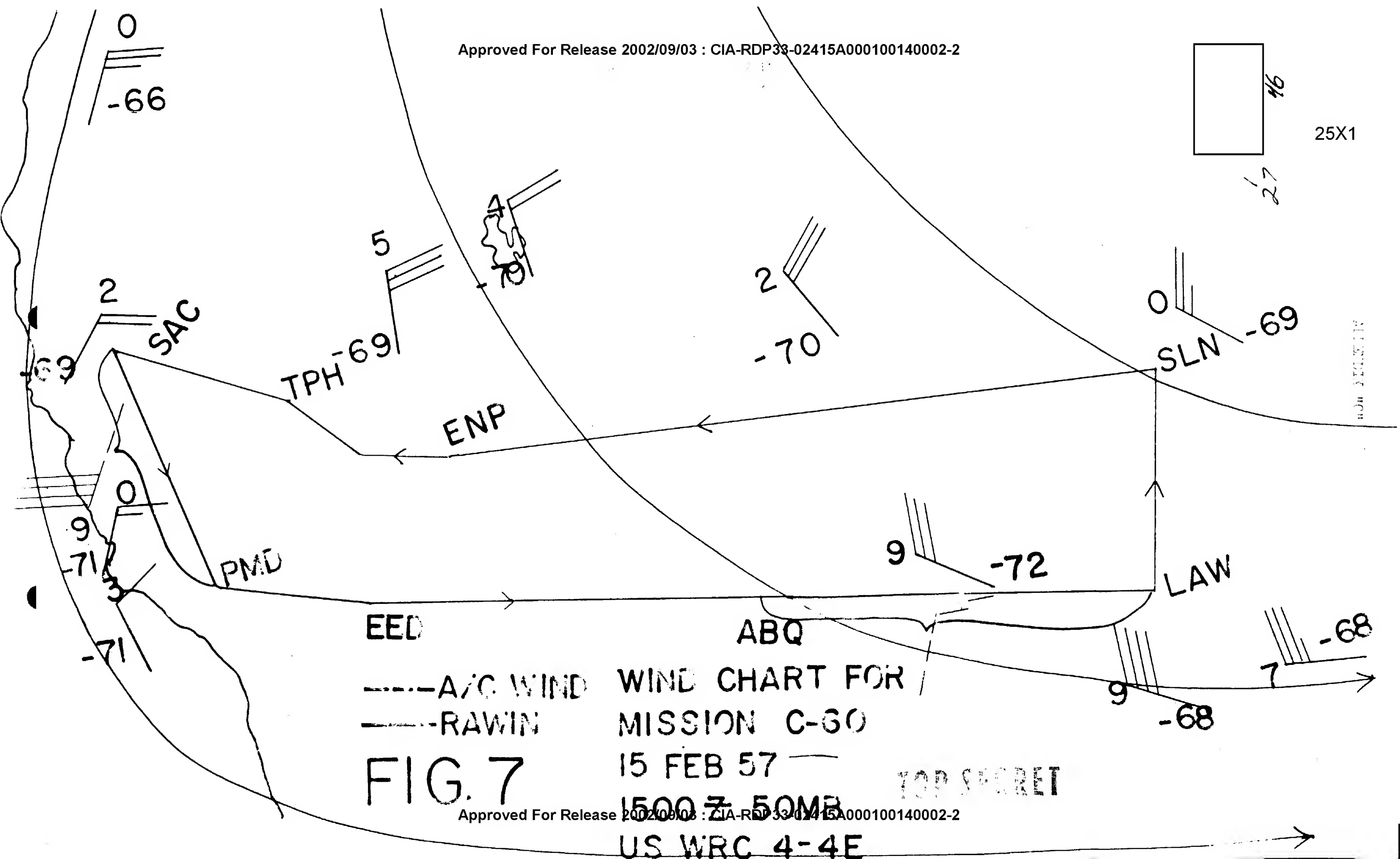

WIND CHART FOR
MISSION C-30
15 FEB 57
1500 Z 50MB
US WRC 4-4E

FIG. 7

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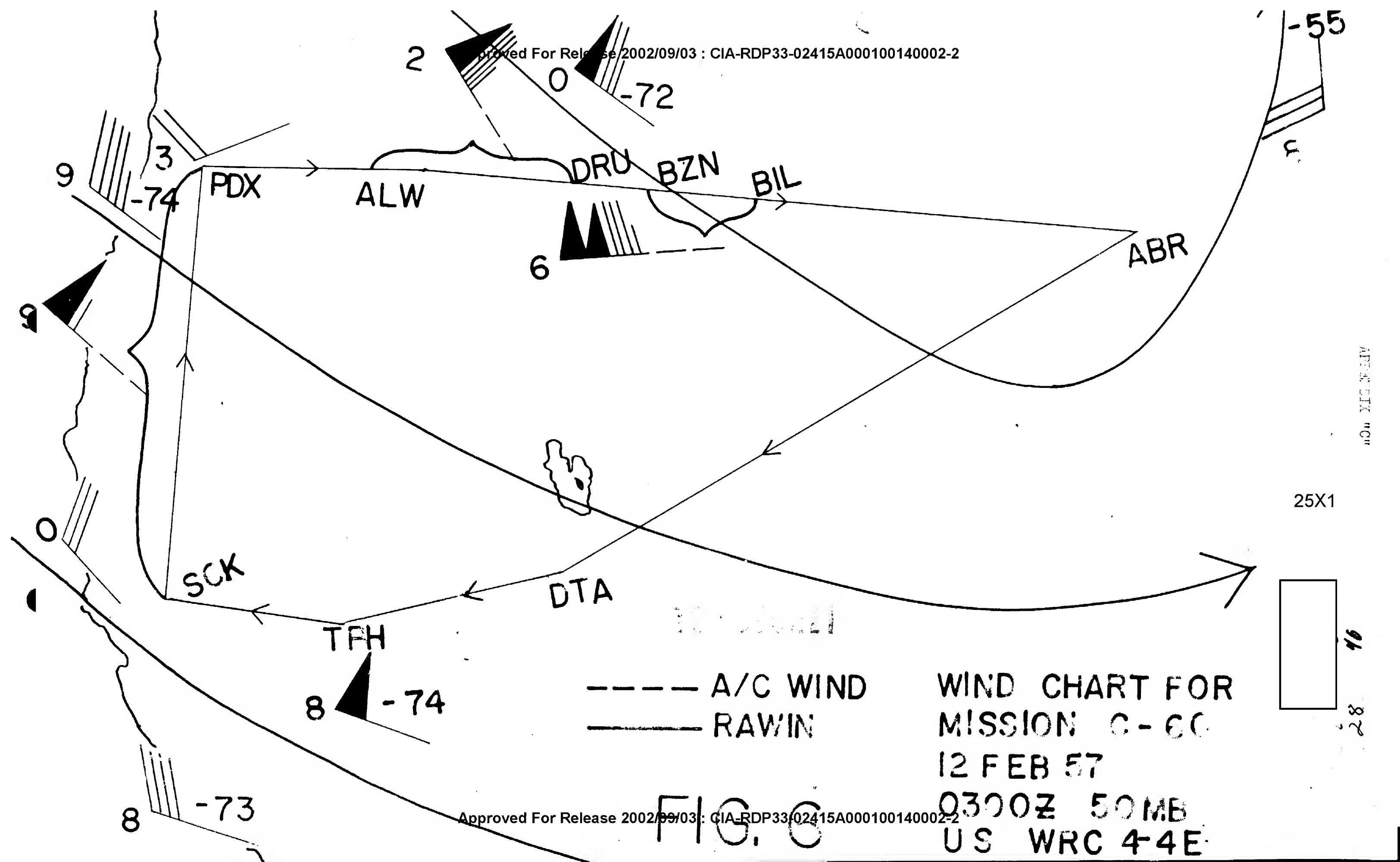

FIG. 6

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APPENDIX "C"

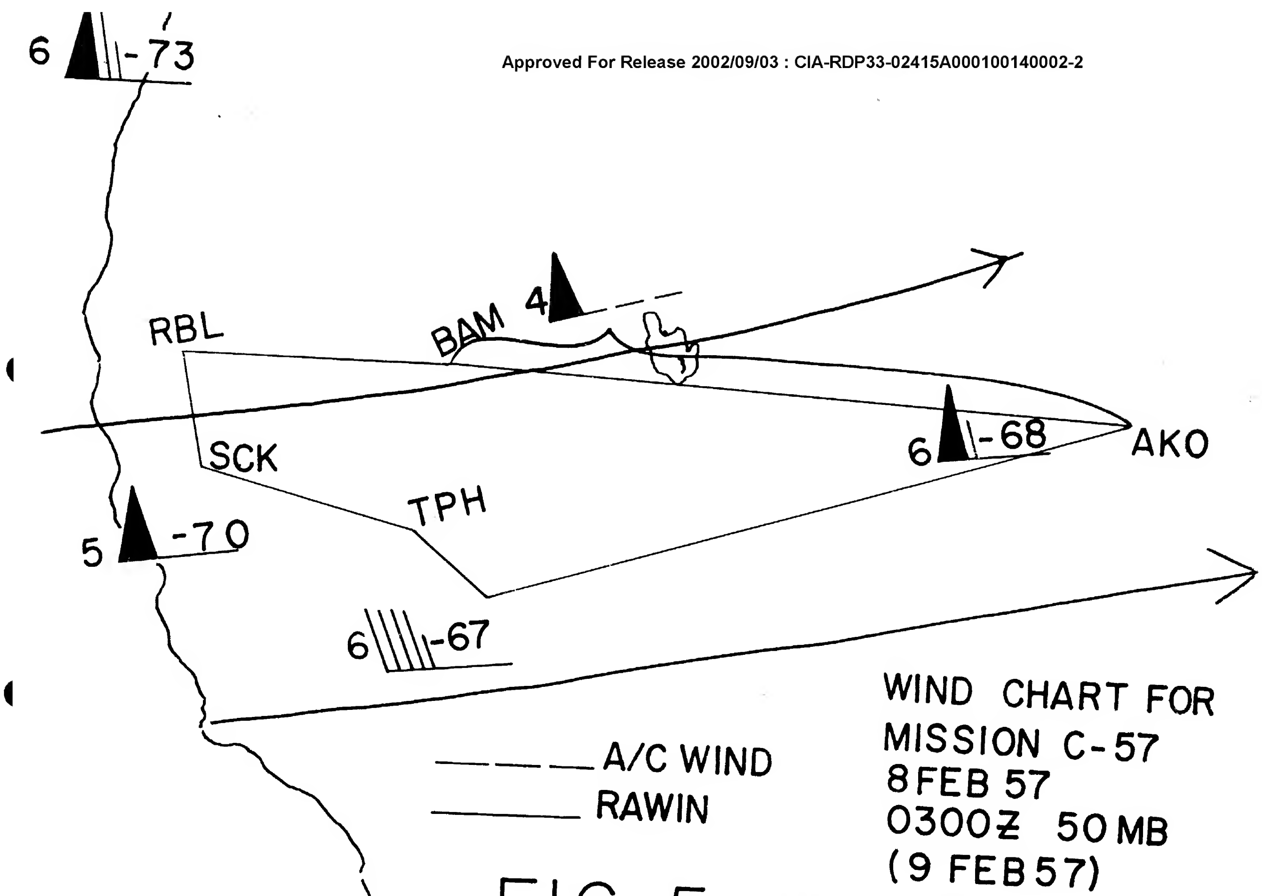
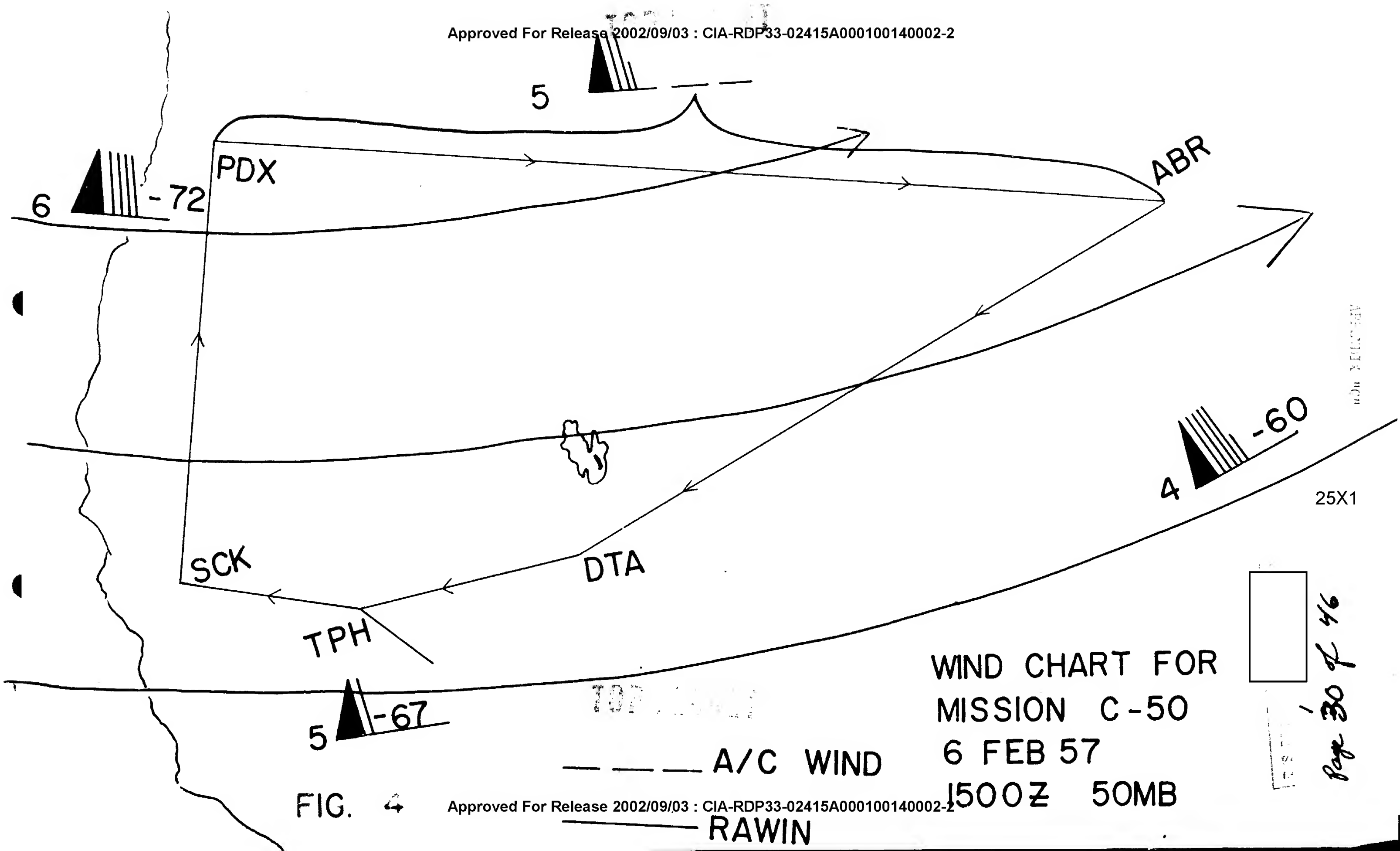


FIG. 5

US WRC 4-4E



WIND CHART FOR
MISSION C-50
6 FEB 57
1500Z 50MB

FIG. 4

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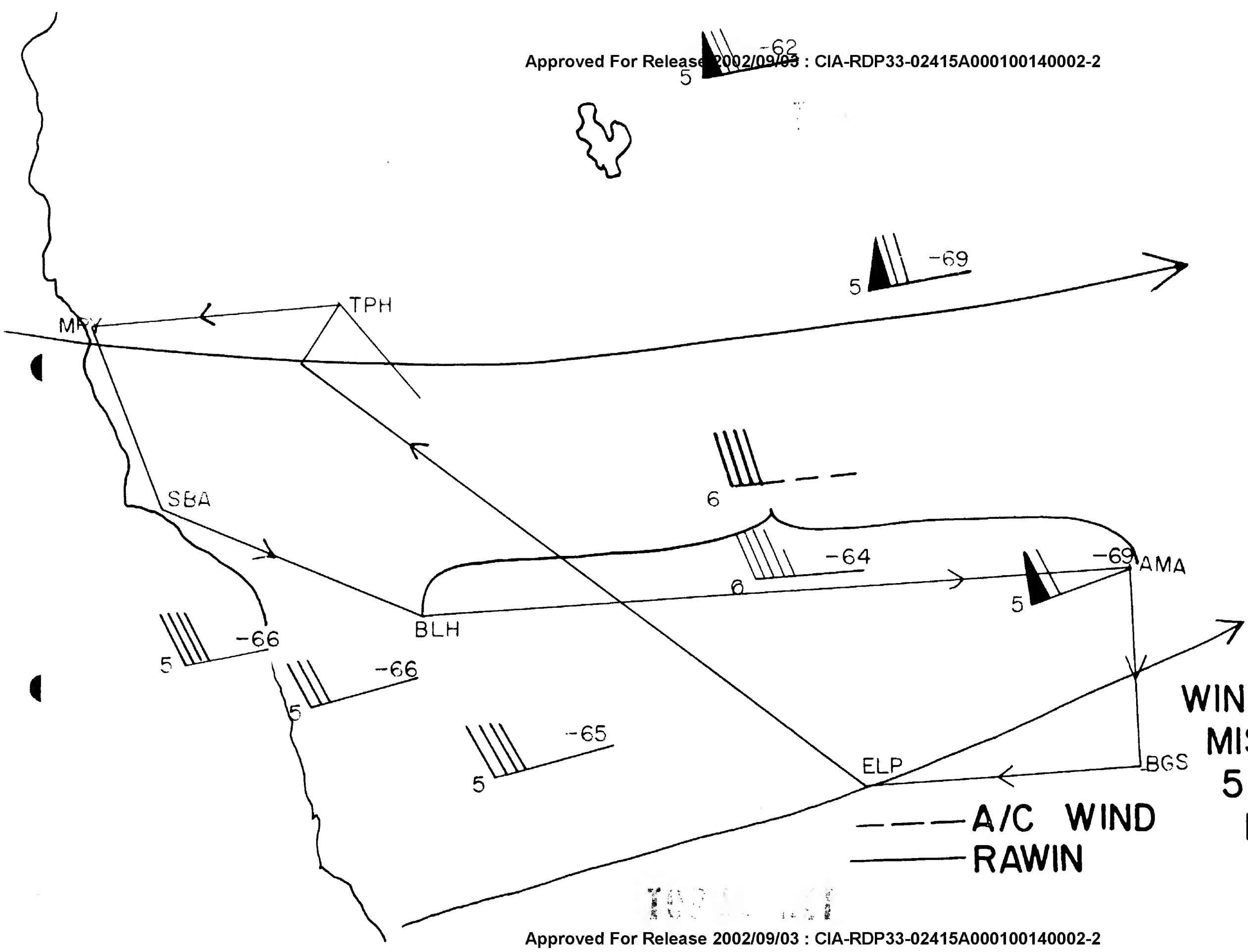
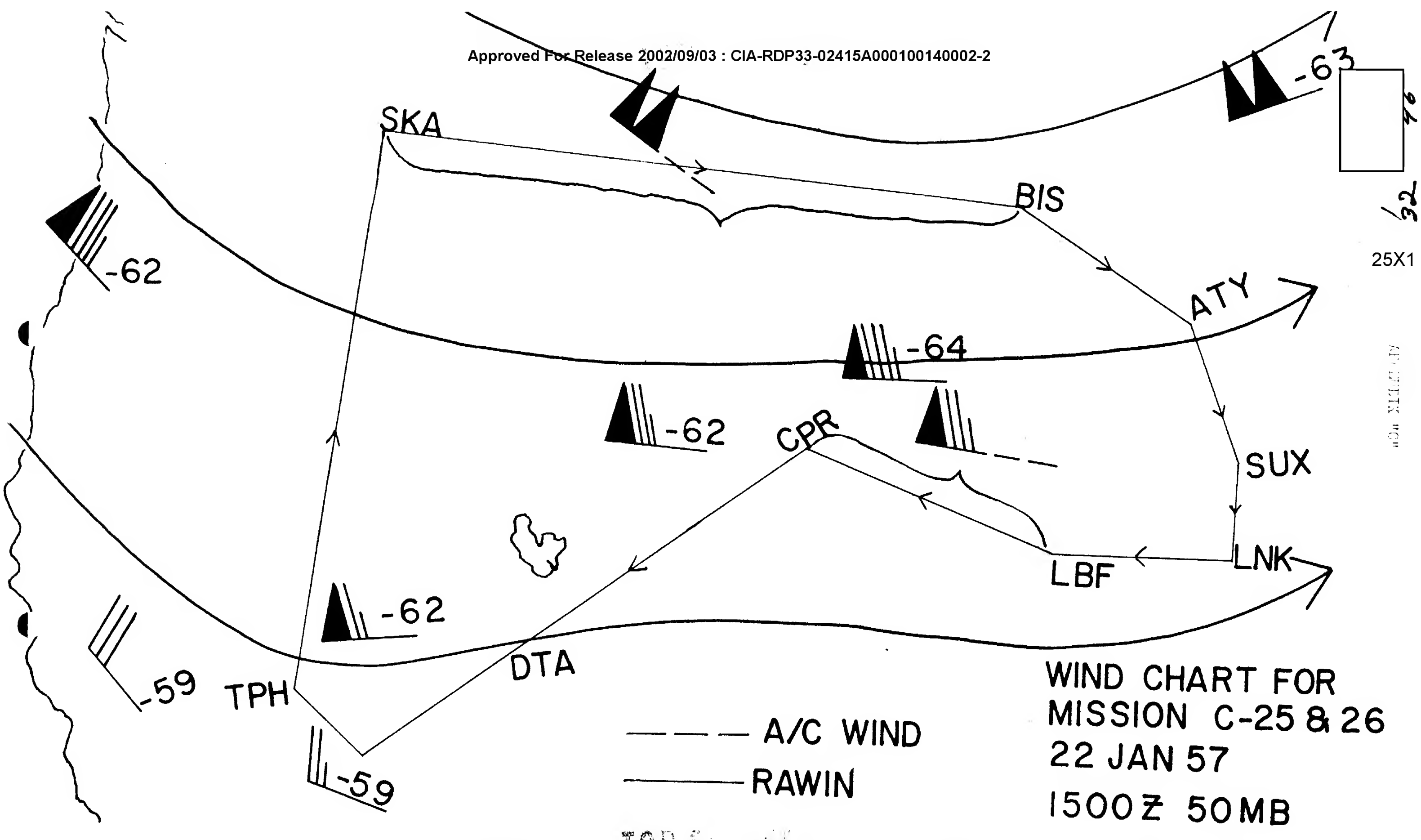


WIND CHART FOR
MISSION C-46
5 FEB, 1957
1500Z 50MB

FIG. 3



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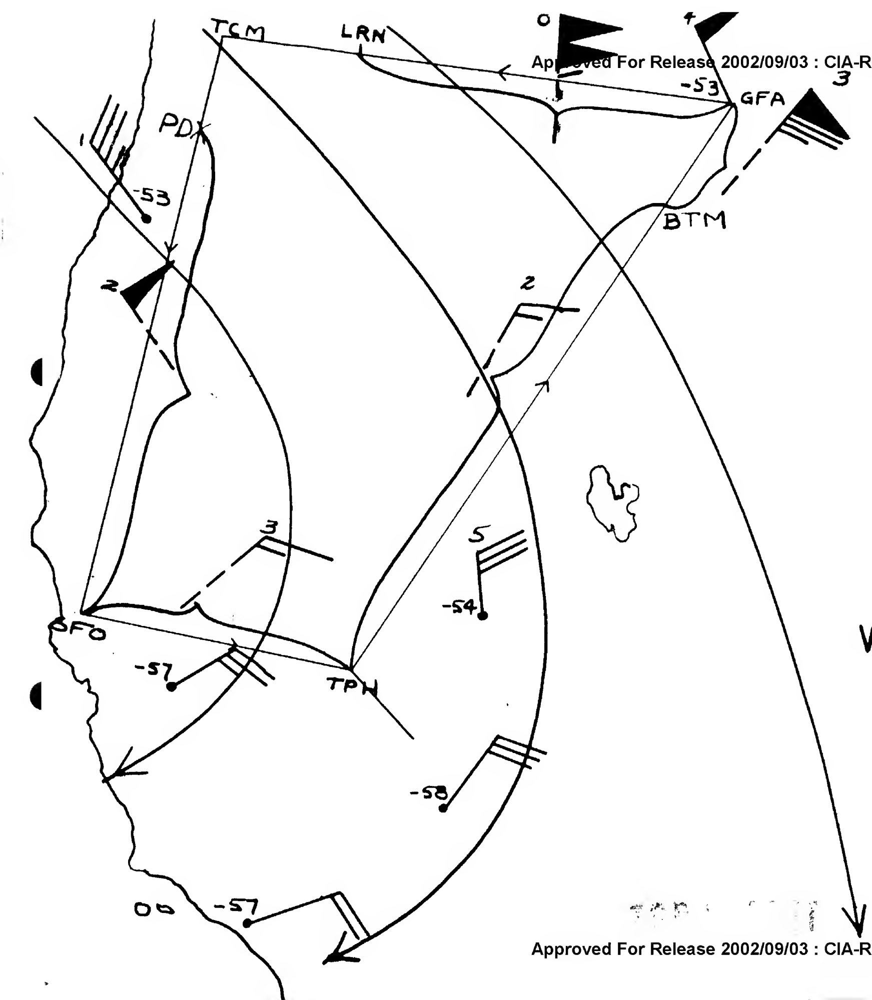
WIND CHART FOR
MISSION C-25 & 26
22 JAN 57
1500Z 50MB

FIG. 2



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WIND CHART FOR
MISSION C-20
17 JAN 57
1500Z 50MB

US WRC 4-4E

— — — A/C WIND
——— RAWIN

FIG. 1

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SECTION VIII

ABORT AND MALFUNCTION REPORT

1. This report is submitted as a resume of the Abort and Malfunction activity experienced by this detachment since 15 Nov 1956. During this period forty eight (48) Malfunctions and three (3) Air Abort reports were submitted for Board action.

2. Areas of outstanding materiel weaknesses was noted during this period and corrective action was taken in the form of closer maintenance supervision, inspection, and submitting U.R's on the basis of Board recommendations. U.R's were submitted on the following systems or units:

UNIT	DEFECT
Elevator Trim Relay	Contacts sticking
Cabin Heating	Mag. Amplifier INOP
Air Conditioning	Refrigerator Turbin Froze
Fuel System	Air Pressure Regulator Erratic
Hydraulic	"O" Rings Popped on Flap Drive Motor

3. Air Aborts during this period are presented in the following breakdown:

UNIT	DEFECT	CAUSE
Personal Equipment	Leaking Oxygen	Unknown-Suspect face-plate improperly seated - Personnel error
Power Plant	No oil Pressure	Oil Pressure Transmitter Failure
Pressurization	No Pressurization	Cause Unknown-This was a short-lived defect and has no possible accountability since no defects were present on ground check and no repeats on succeeding flights.

4. In order to present a more detailed picture in regards to malfunction activity, the following information is given:

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SYSTEM	NO. OF MALFUNCTIONS		MATERIEL FAILURE	MAINT ERROR
Airframe	1	(1) Contacts of elev. trim relay sticking	X	
Auto Pilot	9	(1) Auto Pilot precesses after turns	X	
		(2) Defective MA-1 compass	X	
		(3) Rate switch needed with MA-1	X	
		(4) Rate switch needed with MA-1	X	
		(5) Intermittant operation of Auto Pilot	X	
		(6) Sensitivity of Mach centering and Mach Control	X	
		(7) Defective Trim Servo	X	
		(8) Trim Servo Mal-adjusted		X
		(9) Mach amplifier and roll trim Mal-adjusted		X
Cooling and Pressurization	3	(1) Refrigerator Turbine Froze	X	
		(2) Mag Amplifier INOP	X	
		(3) Refrigerator Turbine Froze	X	
Fuel	1	(1) Air Press Regulator erratic	X	
Hydraulics	3	(1) Air in brake lines	X	
		(2) Hydraulic Press. tube leaking	X	
		(3) O-Ring popped on flap drive motor and hydraulic hose on hydraulic pump leaked	X	
Instrumentation	1	(1) Vertical speed indicator error - 350-400 ft descent		X
Personal Equip	2	(1) Loose neck seal		X
		(2) Broken "O" Ring on male dis-connect	X	
Photographic	4	(1) Film jam in take up system	X	
		(2) Micro-switch failure	X	
		(3) Erratic tracking & film tear	X	
		(4) Oblique drive failed (B Camera)	X	
Photographic Support (Drift Sight)	8	(1) Binding in flexible cables	X	
		(2) Freeze up of lubricants on parts at high altitude	X	
		(3) Unit freezes up at altitude	X	

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SYSTEM	NO. OF MALFUNCTIONS	DEFECT	MATERIEL ERROR	MAINT ERROR
		(4) Out of bore sight		X
		(5) Improper routing of cables		X
		(6) Optics dirty and oily		X
		(7) Optics dirty		X
		(8) Difficult to find detent lock	X	
Power Plant	5	(1) Flame out - cause unknown	X	
		(2) Three flame outs - Engine Fuel flow control erratic	X	
		(3) Surge bleed valve Gov. INOP	X	
		(4) Surge bleed valve Gov. INOP	X	
		(5) Foreign matter in bleed valve control	X	
Radio	8	(1) ARC-34 defective component	X	
		(2) ARC-34 defective component	X	
		(3) ARC-34 defective component	X	
		(4) ARC-34 defective component	X	
		(5) ARC-34 defective component	X	
		(6) ARC-34 - Intercom gain turned to zero by unknown personnel		X
		(7) ARN-6 - Antenna Lead making intermittant contact		X
		(8) ARN-6 - Antenna connection left loose by Auto Pilot personnel		X
Sextant	3	(1) Sextant bubble too large	X	
		(2) Sextant bubble too large	X	
		(3) Oil seepage thru seals causing bubble to disappear	X	
TOTAL MALFUNCTIONS	48	TOTAL MATERIEL FAILURES -	37	
		TOTAL MAINTENANCE ERRORS -		11

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SECTION IX

CONCLUSIONS

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1. The most significant lessons learned by Detachment "C" in its operations [redacted] are:

a. Highly acceptable navigational accuracy can be obtained by celestial means. (Appendix A)

b. Forecast winds at operational altitudes have proved to be highly reliable. (Appendix B)

c. Personnel equipment has generally been highly satisfactory. Recurrent difficulties have been found with unsatisfactory flying boots, causing many cases of cold feet, and face plate heat failures utilizing the normal face heat system.

d. The operational superiority of the J57-P31 engine over the J57-P37 engine.

e. The MK-3 drift sight hand control sight is far superior to any previous model.

f. The high degree of reliability experienced with the "A-2" configuration. **

g. The marginal reliability of the "B" configuration. **

h. The performance of the U-2 is ideal for the assigned mission.

** "Report of Camera Reliability", 31 Jan 57 - Furnished Project Headquarters.

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SECTION X

RECOMMENDATIONS

1. Detachment "C" be equipped with all authorized U-2 aircraft as soon as possible.

2. If another detachment is formed, the units authorized mission equipment should be available to the unit in sufficient time to permit a shake down period and establishment of an acceptable reliability factor prior to deployment.

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REPORT ON

CAMERA RELIABILITY

(PHASE IV)

1 March 1957

This report should be considered as a follow-up of a previous report dated 31 January 1957, which contained the camera activity of this detachment for 1956.

Although the information and data contained herein stresses the photo activity of this organization from 1 January to 1 March 1957, certain data has been borrowed from the initial camera report. In order that some comparison be provided, figures pertaining to previous phases of operation are presented. Without referring to the previous camera reliability report these phases of operation were established as: Phase I, (Training Phase); Phase II, (USCM); and Phase III, (Post - USCM). The time period of operations during January and February 1957 has been established as Phase IV or pre-deployment phase.

During Phase IV, mention should be made that camera maintenance was taxed with the extra problem of camera overhaul due to receiving cameras during this period that needed above average maintenance attention. Time and effort were required to bring these units to a satisfactorily operating level, and in effect dampened the effort in trying to reach that 100% effectiveness goal.

In the analytical breakdown the column headings used are presented with the following meaning:

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APPENDIX "D"

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PHASE	- Period of training involved
NUMBER OF SORTIES	- Flights made during each phase
TOTAL FLIGHT HOURS	- Aircraft time flown during each phase
HOURS EQUIP. SCHED.	- Time in hours that each configuration is scheduled for camera activity
HOURS EQUIP. OPER.	- Time in hours that each unit accomplished positive operation
HOURS PER CENT	- Camera scheduled versus camera operation
TOTAL FOOTAGE SCHED.	- Total footage of film scheduled during phase of photo activity
TOTAL FOOTAGE TRANS.	- Total footage transported during phase of photo activity
FOOTAGE PER CENT	- Footage scheduled versus footage transported
REMARKS	- Any related data

Although this report stresses phase IV performance, Phases I, II, and III are also presented so that the reader can more readily observe the progress in this organizations camera activity.

The analytical breakdown of the data presented is concentrated on usage of these camera configurations - the T-1 (Tracker), the "A-2" (Three 24" cameras), and the "B" with dual magazines.

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PROGRESSIVE COMPARATIVE ANALYSIS FOR THE T-1 (TRACKER)

PHASE	NO. OF SORTIES	TOTAL FLIGHT HOURS	HOURS EQUIP SCHED	HOURS EQUIP OPER	HOURS PER CENT	TOTAL FOOTAGE SCHED	TOTAL FOOTAGE TRANS	FOOTAGE PER CENT
I	23	170:35	155:24	113:42	73.2%	15,540	11,370	73.2%
II	7	54:40	52:00	41:45	80.3%	5,200	4,175	80.3%
III	31	179:19	154:55	126:27	82%	15,487	12,633	82%
IV	57	345:43	294:22	247:11	84%	28,447	26,867	91%
TOTAL ACCOMP	118	750:17	656:41	529:05	80.5%	64,674	55,045	85%

PROGRESSIVE COMPARATIVE ANALYSIS FOR THE A-2*

PHASE	NO. OF SORTIES	TOTAL FLIGHT HOURS	HOURS EQUIP SCHED	HOURS EQUIP OPER	HOURS PER CENT	TOTAL FOOTAGE SCHED	TOTAL FOOTAGE TRANS	FOOTAGE PER CENT
I	3	24:32	40:33	36:00	88.8%	14,598	12,960	88.8%
II	5	39:15	60:09	50:19	83.6%	21,666	18,121	83.6%
III	2	14:25	27:00	24:30	90.74%	9,720	9,720	100%
IV	6	47:32	85:00	81:53	96%	30,600	29,478	96%
TOTAL ACCOMP	16	125:44	212:42	192:42	90.5%	76,584	70,279	92%

*In the above analysis of the A-2, the unit is considered as three individual cameras and the figures in equipment hours and footage represent a total composite potential. An example would be an 8 hour mission with the camera activity scheduled for 5 hours and 1800 feet of film on each camera - the R-6, V-7, and L-8. During this five hours of camera operation, three units are exposed to the risk of encountering a malfunction, and to fly a perfect mission all three pieces of equipment must operate perfectly. However, if one camera should completely fail the mission should not be considered of negative value,

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because two other cameras are obtaining photo and intelligence data. Therefore, in the above example, the total composite potential for the A-2 would be 15 hours and 5,400 feet of film. The performance of the configuration is then compared against these figures to arrive at a more realistic percentage on camera reliability.

PROGRESSIVE COMPARATIVE ANALYSIS FOR THE "B"**

PHASE	NO. OF SORTIES	TOTAL FLIGHT HOURS	HOURS EQUIP SCHED	HOURS EQUIP OPER	HOURS PER CENT	TOTAL FOOTAGE SCHED	TOTAL FOOTAGE TRANS	FOOTAGE PER CENT
I	4	23:53	23:32	1:23	05.8%	32,000	4,366	13.6%
II	2	15:25	11:51	0:18	02.5%	16,000	400	02.5%
III	17	100:12	63:27	40:54	64.5%	85,548	56,490	66%
IV	10	76:45	47:17	16:50	35.5%	76,350	45,066	59%
TOTAL ACCOMP	33	216:15	146:07	59:25	40.5%	209,898	106,322	51%

**Composite potential for the "B" configuration is given in the columns under footage scheduled and footage transported so that a fair evaluation can be made with regards to the dual magazine set-up for this camera.

The following figures are presented as a summary of photo activity of Detachment "C" involving all phases and configurations from 1 October 1956 to 1 March 1957. This should indicate to some degree the capability of Equipment and Personnel.

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CON FIGU RATION	NO. OF SORTIES	TOTAL FLIGHT HOURS	HOURS EQUIP SCHED	HOURS EQUIP OPER	HOURS PER CENT	TOTAL FOOTAGE SCHED	TOTAL FOOTAGE TRANS	FOOTAGE PER CENT
T-1	118	750:17	656:41	529:05	80:5%	64,674	55,045	85%
A-1	4	19:11	49:10	49:10	100%	6,301	6,301	100%
A-2	16	125:44	212:42	192:42	90.5%	76,584	70,279	92%
B	33	216:15	146:07	59:25	40.5%	209,898	106,322	51%
Dual Vert	12	66:21	70:00	66:27	95%	24,896	23,626	95%
TOTAL DETACHMENT ACCOMPLISHMENTS	***	***	1134:40	896:49	79%	382,353	261,573	68.5%

***A total of these columns would be unrealistic since most every sortie involved the tracker camera plus one other camera configuration. The total flight hours and sorties for the detachments photo missions would approximate those figures found opposite the T-1 configuration - 118 and 750:17.

Attention is invited to Phase IV for the T-1 Tracker. It will be noted that numerous hours were scheduled and flown and yet the percentage figures showed an increase over the previous phases. This helps to substantiate the conclusions drawn during the previous camera reliability report - that maintenance "knowhow" improves with age.

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Operations Analyst

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Analysis of
Equipment Performance

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ANALYSIS OF
EQUIPMENT PERFORMANCE
(Top Secret When Filled In)

Period Covered January & February 1957 — Type or Configuration T-1

Pre-Deployment Phase

NO. OF SORTIES FLOWN	TOTAL FLIGHT HOURS	GROUND ABORTS DUE TO EQP MAL	AIR ABORTS DUE TO EQP MAL	NO. OF HOURS SCHED FOR EQP	NO. OF HOURS EQP OPR	% SCHED VERSUS OPER	FILM TRANSPORT (CAMERAS ONLY)				REMARKS
							TOTAL FOOTAGE SCHEDULED	TOTAL FOOTAGE TRANSPORTED	PER CENT FOOTAGE SCHED VERSUS TRANSPORTED	CAMERA TYPE	
57	345:43	0	0	294:22	247:11	84%	28,447	26,867	91%	T-1	

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ANALYSIS OF
EQUIPMENT PERFORMANCE
(Top Secret When Filled In)

Period Covered January & February 1957
Pre-Deployment Phase

Type or Configuration A-2

NO. OF SORTIES FLOWN	TOTAL FLIGHT HOURS	GROUND ABORTS DUE TO EQP MAL	AIR ABORTS DUE TO EQP MAL	NO. OF HOURS SCHED FOR EQP	NO. OF HOURS EQP OPR	% SCHED VERSUS OPER	FILM TRANSPORT (CAMERAS ONLY): TOTAL FOOTAGE SCHEDULED	TOTAL FOOTAGE TRANSPORTED	PER CENT FOOTAGE SCHED VERSUS TRANSPORTED	CAMERA TYPE	REMARKS
		0	0	30:00	28:47	96%	10,800	10,364	96%		
6	47:32	0	0	30:00	30:00	100%	10,800	10,800	100%		
		0	0	25:00	23:06	92.4%	9000	8314	92.4%		
TOTAL COMPOSITE POTENTIAL - EQUIPMENT HOURS & FILM FOOTAGE											
6	47:32	0	0	85:00	81:53	96%	30,600	29,478	96%		

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ANALYSIS OF
EQUIPMENT PERFORMANCE
(Top Secret When Filled In)

Period Covered January & February 1957
Pre-Deployment Phase

Type or Configuration B

NO. OF SORTIES FLOWN	TOTAL FLIGHT HOURS	GROUND ABORTS DUE TO EQP MAL	AIR ABORTS DUE TO EQP MAL	NO. OF HOURS SCHED FOR EQP	NO. OF HOURS EQP OPR	% SCHED VERSUS OPER	FILM TRANSPORT (CAMERAS ONLY) TOTAL FOOTAGE SCHEDULED	TOTAL FOOTAGE TRANSPORTED	PER CENT FOOTAGE SCHED VERSUS TRANSPORTED	CAMERA TYPE	REMARKS
10	76:45	0	0	47:17	16:50	35.5%	38,175	22,533	59%	(9R)	
							38,175	22,533	59%	(9L)	
TOTAL COMPOSITE POTENTIAL - EQUIPMENT HOURS & FILM FOOTAGE											
10	76:45	0	0	47:17	16:50	35.5%	76350	45,066	59%	B	Footage Included 9R & 9L Potential

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